

PIP-II 3-Ways Septum Magnet

Preliminary Magnetic Analysis

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Septum magnet specification:

- Integrated dipole field 0.43 T·m;
- Magnet effective length 2.6 m;
- Air gap 40 mm;
- Center magnet field 0.165 T;
- Coil ampere-turns 5400 A;
- Coil copper conductor 9 mm x 9 mm hole diameter 5 mm;
- Coil number of turns 4;
- Coil current 1350 A.
- Yoke – low carbon steel AISI1006-AISI1010, with the thickness 45 mm (top/bottom), 50 mm (backleg).

Variant 1: Both magnets powered.

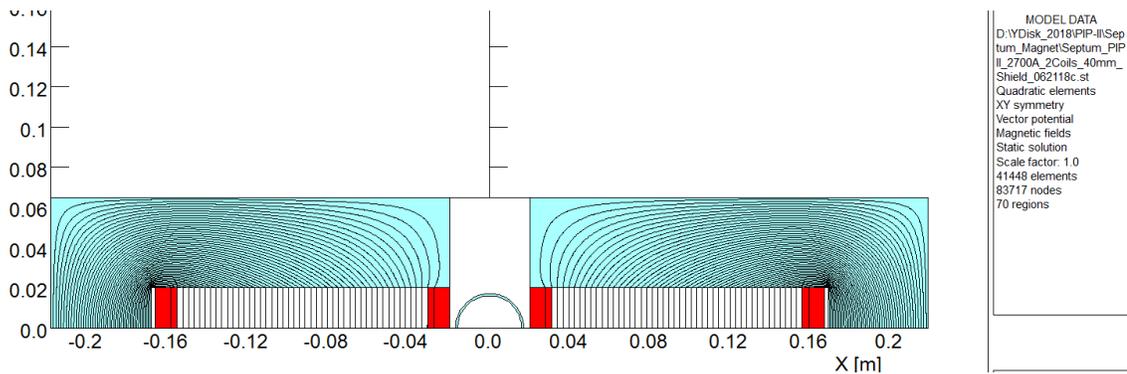


Fig. 1. Magnet flux lines.

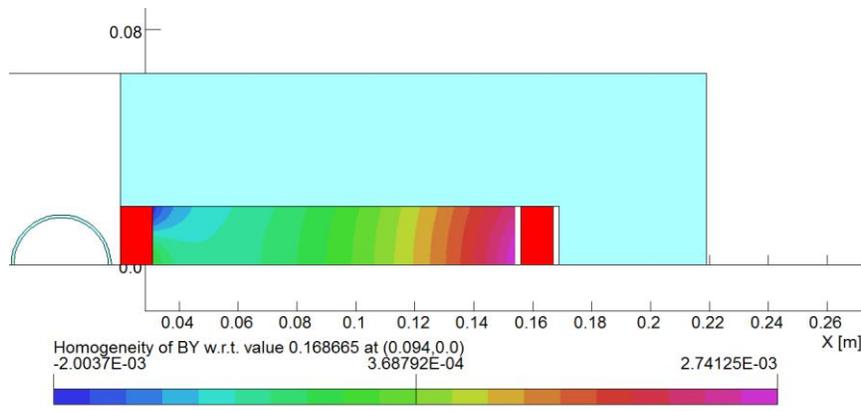


Fig. 2. Field homogeneity in the magnet aperture.

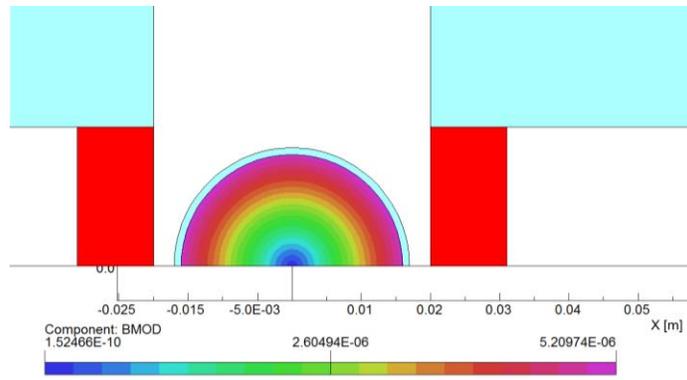


Fig. 3. Fringe field in the shielded circulating beam area.

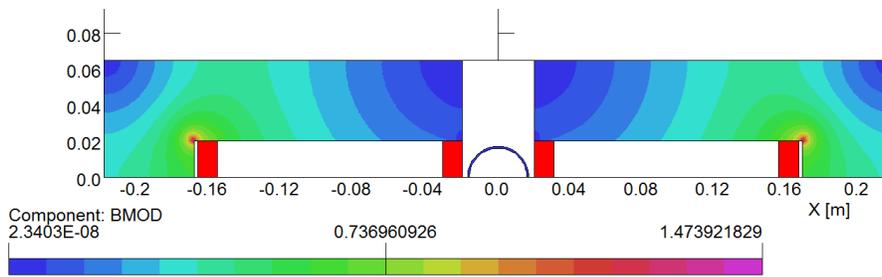
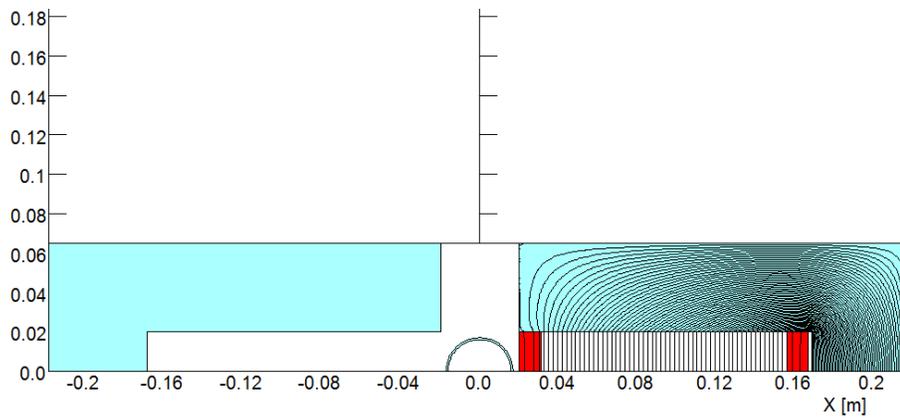


Fig. 4. Flux density in the iron yoke.

Variant 2: One magnet powered.



MODEL DATA
 D:\YDisk_2018\PIP-II\Septum_Magnet\Septum_PIP
 IL_3500A_1Coil_40mm_S
 hield_062118a.st
 Linear elements
 XY symmetry
 Vector potential
 Magnetic fields
 Static solution
 Scale factor: 1.0
 41448 elements
 21135 nodes
 70 regions

Fig. 5. Magnet flux lines.

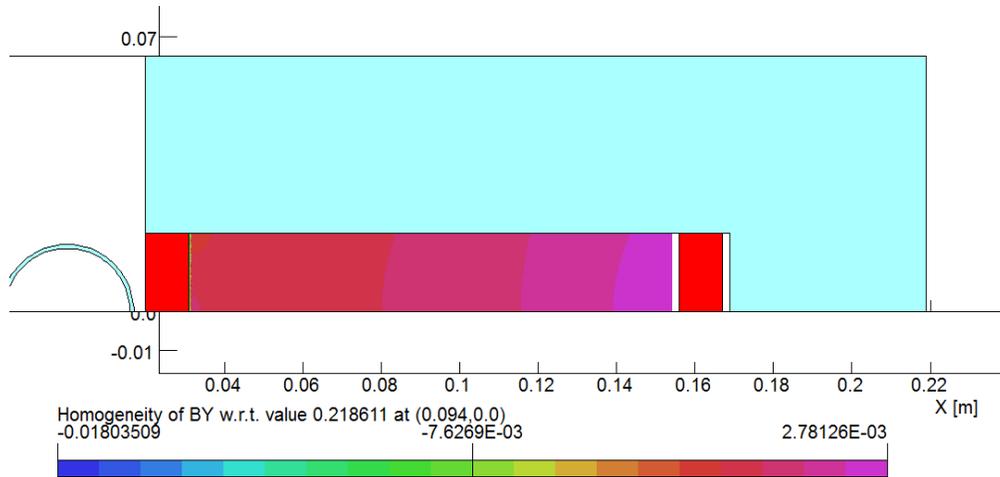


Fig. 6. Field homogeneity in the magnet aperture.

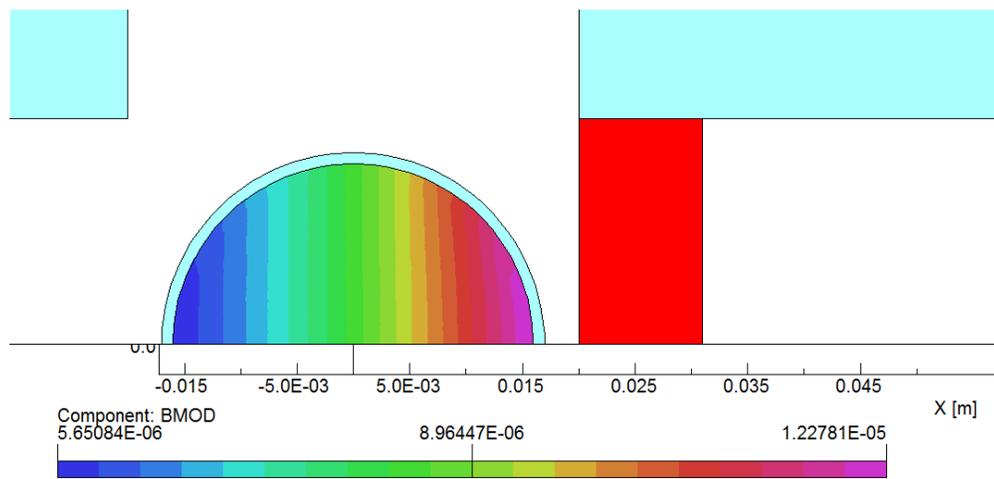


Fig. 7. Fringe field in the shielded circulating beam area.

Summary

The preliminary field analysis showed that it is possible to design the septum magnet in an agreement with the specification. There will be combination of two C-type of magnets with the space between them for the field free region. The round ferromagnetic shield in the circulating beam area about completely shield the fringe field.

Magnets could be powered simultaneously, or separately because do not have coupling effects.